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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/623,757

07/21/2003

Jin Zhao

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EXAMINER

SMITH, FRANCIS P

ART UNIT

PAPER NUMBER

4151

NOTIFICATION DATE

DELIVERY MODE

12/26/2007

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

uspto@ti.com
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Office Action Summary	Application No. 10/623,757	Applicant(s) ZHAO ET AL.	
	Examiner FRANCIS P. SMITH	Art Unit 4151	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 7-12 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 13-18 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/21/2003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-6, 13-18, and 20 are drawn to a method of maintaining a reactor chamber, classified in class 438 subclass 905.
 - II. Claims 7-12 and 19 are drawn to a plasma clean apparatus/system, classified in class 134, subclass 56.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the process as claimed can be practiced by another materially different apparatus that lacks a processor providing notification when the volume of the cleaning gas reaches a predetermined volume.
3. Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:
 - (a) the inventions have acquired a separate status in the art in view of their different classification;

- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;
- (c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- (d) the prior art applicable to one invention would not likely be applicable to another invention;
- (e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention.**

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

During a telephone conversation with Jacqueline J. Garner, Esq. on December 12, 2007, a provisional election was made without traverse to prosecute the invention of group I, claims 1-6, 13-18, and 20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 7-11 and 19 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

DETAILED ACTION

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-6, 13-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Study of the NF_3 plasma cleaning of reactors for amorphous silicon deposition, Bruno et al. in view of Yin et al. (US 6,379,575) and in further view of Xi et al. (US 5,926,743).

Regarding claims 1, 13, and 20, Bruno teaches a method of using NF_3 plasmas for the cleaning of reactors for amorphous silicon deposition from silane. Bruno discloses depositing one or more layers outwardly from an inner surface of a reactor

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chamber of a chemical vapor deposition system (forming an accumulation layer) at a thickness of $4\mu\text{m}$ (establishing a specified thickness) (pg. 691, col.1, lines 14-17).

Then, a plasma clean cycle is employed by introducing a NF_3 cleaning/etching gas (pg. 691, col. 1, lines 14-17). However, Bruno is silent in regard to repeating the processing steps and calculating/providing a notification of a pre-determined volume or the use of software.

Yin teaches a process for treating and conditioning an etching chamber whereby the substrate (e.g. semiconductor wafer) is transported into the etching chamber and the etching, transportation, and cleaning and conditioning steps are repeated (col. 3, lines 61-64).

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. A system controller controls all of the activities of CVD machine. The system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). The controller contains a subroutine for process gas control, which controls process gas composition and flow rates (and thus, capable of calculating the volume of cleaning gas used and providing notification of a predetermined volume) (col. 8, lines 13-14). Subsequently, after completion of the substrate processing operation, the substrate is removed from the processing chamber and a determination is made by the controller as to whether a clean step should be performed, which is analogous to providing a notification and scheduling a chamber maintenance (col. 10, lines 29-33).

Therefore, it would be obvious to one skilled in the art at the time of the invention to adapt Bruno's cleaning method by incorporating Yin's process repetition until a predetermined volume is reached as regulated by Xi's system control software in order to maintain a clean reactor chamber with a minimal accumulation layer capable of coating semiconductor wafers with few impurities.

Regarding claims 2 and 3, Bruno teaches a method of using NF_3 plasmas for the cleaning of reactors. A substrate (e.g. semiconductor wafer) is loaded/received into a load lock chamber and one or more layers is deposited on the received wafer. After approximately 6-8 deposition runs, the thickness of the accumulation layer is calculated at an approximate thickness of $4\mu\text{m}$ (pg. 691, col.1, lines 4-17).

Regarding claims 4-6 and 16-18, Bruno does not disclose a software system capable of establishing/measuring/calculating the volume of cleaning gas for chamber maintenance purposes.

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. As per claims 4, 5, 16, and 17, a system controller controls all of the activities of CVD machine. The system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). The controller contains a subroutine for process gas control, which controls process gas composition and flow rates (col. 8, lines 13-14). Therefore, it would be obvious to one skilled in the art at the time of the invention to utilize Xi's system control software in

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Bruno to establish/measure/calculate the volume of the cleaning gas used during one or more plasma clean cycles in order to effectively regulate the said plasma clean cycles.

Regarding claims 6 and 18, the system controller executes system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). After the completion of the substrate processing operation, the substrate is removed from the chamber and a determination is made by the controller as to whether a clean step should be performed. The clean step is performed after every n substrates are processed (col. 10, lines 29-34). Therefore, it would be obvious to one skilled in the art at the time of the invention to utilize Xi's controller system in Bruno to schedule a chamber maintenance after the plasma gas has reached a predetermined volume in order to maintain a clean reactor chamber having a minimal accumulation layer and capable of coating semiconductor wafers with fewer impurities.

As per claims 14 and 15, Bruno further teaches a method of using NF_3 plasmas for the cleaning of reactors. A substrate (e.g. semiconductor wafer) is loaded/received into a load lock chamber and one or more layers is deposited on the received wafer. After approximately 6-8 deposition runs, the thickness of the accumulation layer is calculated at an approximate thickness of $4\mu\text{m}$ (pg. 691, col.1, lines 4-17). However, Bruno does not teach the use of software.

Xi discloses a method for removing particles and residues that build up inside a substrate processing system during a substrate processing operation. A system controller controls all of the activities of CVD machine. The system controller executes

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system control software, which is a computer program stored in a computer readable medium such as a memory (col. 5, lines 56-60). Therefore, it would be obvious to one skilled in the art at the time of the invention to automate Bruno's cleaning method with Xi's software in order to achieve a controlled and efficient cleaning process.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRANCIS P. SMITH whose telephone number is (571)270-3717. The examiner can normally be reached on Monday through Friday 7:30 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571)272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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FPS

/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 4151